



FUNCTIONAL OUTCOME OF MEDIAL WEDGE OPENING HIGH TIBIAL OSTEOTOMY (MWOHTO) AND RIGID FIXATION IN MEDIAL COMPARTMENT KNEE OSTEOARTHRITIS.

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ABSTRACT

HTO is a commonly done procedure for various indications and is growing in popularity. However, insufficient research has been conducted to assess the efficacy of HTO and the clinical outcomes of the treatment. The purpose of this study was to investigate at the functional outcome of a medial wedge opening high tibial osteotomy in medial compartment knee osteoarthritis. Materials and Methods: A total of 30 patients symptomatic of medial compartment knee osteoarthritis underwent Medial Wedge Opening High Tibial Osteotomy in our institution and were followed up for at least 2 years. At the end of 2 year follow-up, the functional outcome of the procedure was interpreted using Tegner Lysholm Knee score. Results : A total of 30 patients, (20 males, 10 females, mean age 40.1 years) with a follow-up of 2 years were included. Two patients were lost to follow-up. The mean Tegner Lysholm Knee score obtained was 74.75 which is a fair outcome. Additionally, radiographic evaluation revealed no significant progression of osteoarthritis of knee. Conclusion :This study shows that MWOHTO is an effective method to treat medial compartment osteoarthritis in young and active individuals as shown by Tegner Lysholm Knee Scores.

KEYWORDS : Medial Wedge Opening High tibial osteotomy; Tegner Lysholm Knee score

INTRODUCTION

Osteoarthritis (OA) is a chronic age-related degenerative disease of the joints characterized by gradual articular cartilage degradation and softness along with the formation of new bone at the joint borders.¹

Non-surgical therapy approaches for osteoarthritis may be effective in its early stages. As the condition progresses to end-stage medial osteoarthritis (MCOA), surgical therapy options include high tibial osteotomy (HTO), unicompartmental knee arthroplasty (UKA), and total knee arthroplasty. High tibial osteotomy is a joint-preserving procedure that, when performed correctly, should not jeopardize future arthroplasty.^{2,3}

The biomechanical basis of HTO in MCOA is to shift weight-bearing stresses from the afflicted medial compartment to the lateral compartment, which relieves discomfort and slows disease development.⁴ A high tibial osteotomy can be performed using medial opening wedge osteotomy, lateral closing wedge osteotomy, or non-wedge procedures such as dome osteotomy and hemicallotasis osteotomy with an external fixator.

Jackson first employed it in 1958 to treat osteoarthritis. The most established procedure is lateral closure wedge osteotomy, which was first reported by Coventry.^{5,6}

This procedure is particularly effective in younger and more physically active patients, where it tries to shift the weight-bearing axis of the lower limb from the arthritic medial compartment to the normal lateral compartment, resulting in pain relief and slowing disease progression. HTO has two goals: 1) to alleviate knee pain by moving weight-bearing loads to the relatively unaffected lateral compartment in varus knees, and 2) to delay the need for a knee replacement by slowing or preventing the degeneration of the medial joint compartment. Although the use of HTO has lately declined due to advances in knee arthroplasty, it is obvious that effective outcomes with HTO can still be achieved by careful patient selection, rigorous surgical planning, and the application of varied operating approaches.^{7,8,9}

Objectives

To assess the functional outcome of Medial opening wedge high tibial osteotomy with rigid fixation after the correction of mechanical axis of the lower limb using Tegner Lysholm Knee Score (TLK).

MATERIALS AND METHODS

This prospective study was performed in the Orthopaedic Department of Vydehi Institute of Medical Sciences and Research Center, Bangalore, India, which is a tertiary care institute. The study was conducted over a time period of 5 years (January 2017 to April 2022).

The study included patients of either sex who are under 45 years of age, experiencing pain in the medial compartment of knee due to osteoarthritis, diagnosed with knee X-ray including sky-line view and lower limb scannogram.

Mechanical axes of both the lower limbs were drawn and compared. The Mikulicz's line which is plotted from the center of the hip to the center of the ankle is drawn. Fujisawa et al. reported that the postoperative mechanical axis should pass through the lateral one third of the tibial plateau¹⁰. Patients in whom this line passes medial to the Fujisawa point were considered for Medial Wedge Opening High tibial Osteotomy. The correction angle was generated at the hinge point subtending the current and proposed ankle centre using Miniaci method¹¹. The opening wedge was plotted to measure an opening distance. The osteotomy was secured using a locking plate.

In this study, information regarding the age, sex, side of the knee affected, duration of symptoms and limitations in day to day activities of the patient due to his condition were collected. The patients were then counselled about their condition and were recommended the MWOHTO procedure. With the patient's consent, all the pre-anesthetic evaluations were done and the patients that were fit for the surgery underwent the procedure. The post-operative protocol involved taking an X-ray of the operated limb. Knee range of motion and static and dynamic quadriceps strengthening physiotherapy were

initiated. Patients were mobilized without weight bearing of the operated limb for 6 weeks. Patients were followed up at 2 years. At the end of the follow-up, the patient's functional outcome were assessed using Tegner Lysholm Knee score.

Inclusion Criteria-

- 1) Age - less than 45 Years of either sex
- 2) Symptomatic pain in the medial compartment of knee due to osteoarthritis

Exclusion Criteria- Bi-compartmental knee osteoarthritis

Interpretation of Tegner Lysholm Knee Score:

95-100: Excellent

84-94: Good

65-83: Fair

<65: Poor

- Higher the TLK score, better is the functional outcome

The surgical technique- MWOHTO¹²

1. Patient Positioning and Preparation: The patient is positioned supine on a radiolucent operating table. A tourniquet is applied to the affected limb.



Fig 1: Pre-operative Scannogram

2. Incision and Exposure: A 5-cm vertical incision is made between the medial tibial tuberosity and the posteromedial tibia, below the joint line. The pes anserinus tendon is detached to reveal the superficial medial collateral ligament (MCL). The distal section of the MCL is separated from the bone. A blunt retractor is placed behind the MCL and tibia to protect the neurovascular structures during surgery.

3. Dissection and Guide Wire Insertion: Subperiosteal dissection is carried out from the tibial tuberosity to the posteromedial tibia. Two guide wires are inserted at a point 3.5-4 cm below the medial joint line, angled obliquely towards the fibular head, 1 cm beneath the lateral tibial articular margin. The position of the guide wires is confirmed using a C-arm.

4. Tibial Osteotomy: The osteotomy is performed just below the guide wires with an oscillating saw or osteotome. The osteotomy site is tested for mobility and gradually opened by applying a valgus force. A calibrated wedge is used to adjust the opening to the desired extent of correction.

5. Internal Fixation: After achieving the desired correction, a metal plate is fixed in place. Appropriate size screws are inserted under C-arm guidance to secure the plate.

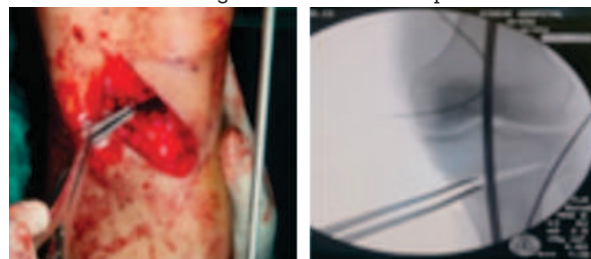


Fig 2: Intra-operative Image With C-arm Image



Fig 3: Post-operative X Ray

RESULTS

The findings of this study suggest that performing MWOHTO using locking plates in patients symptomatic of medial compartment of knee due to osteoarthritis produce fair to good Tegner Lysholm Knee score. The mean age was 40.1 years (37-45 years). There were 20 (66.67%) in males and 10 (33.34%) in females. The mean Lysholm score was 74.75. Similar findings were reported in several other studies.

Out of 30 patients, 11 patients left side is involved whereas 19 patients right side is involved. Out of 30 patients, 20 patients were male and 10 patients were female.

The Lysholm and Tegner activity scores were used in the study. Rudert, M., et al. (2021) evaluated the results of patients who received medial opening wedge HTO. The results indicated a considerable improvement in both scores following surgery, indicating effective functional recovery and return to activity. The mean Lysholm score in this study was 75.5 (SD 18.4).

DISCUSSION

The mean age was 40.1 years (37-45 years). There were 20 (66.67%) in males and 10 (33.34%) in females. The mean Lysholm score was 74.75. similar ages were seen in many studies.

A retrospective cohort study conducted by Van Wulfften Palthe, A F Y et al. performed HTO for 223 subjects for medial osteoarthritis of the knee and demonstrated that the medium-to long-term survival and functional outcome after HTO was

good to excellent at 10-20 years of follow-up using data based on Tegner Activity Scale, Lysholm Knee Score, and Visual Analogue Scale.¹³

Rinonapoli et al. employed the hospital for special surgery score system (HSS) and found that 55% of knees had excellent or good results, whereas 45% had fair to poor results after 15 years.¹⁴ Majima et al. found that knee function score improved from 59 +/- 5.5 points before surgery to 85 +/- 6.1 points after surgery, with no significant decline (80 +/- 5.4) over 10 years. A study indicated that the degree of correction after surgery was linked to the progression of osseous arthritis. Higher valgus correction resulted with slower progression of medial compartment arthritis.¹⁵ Berman et al. found good results in 57%, fair results in 18%, and poor results in 25% of patients after 8.5 years¹⁶.

HTOs rarely cause vascular damage. Osteotomies performed at 90-degree knee flexion are thought to reduce the incidence of popliteal artery injury. A duplex ultrasound examination in healthy volunteers revealed that the popliteal artery is closer to the tibia in 90-degree knee flexion than in full extension.¹⁷ To prevent unintended vascular injury during surgery, patients should be carefully evaluated for vascular insufficiency and anatomical details should be taken into consideration.

CONCLUSION

The functional outcome after HTO was fair to good at 2 years of follow-up. MWOHTO with a locking plate in our study has shown to be an effective way to treat medial compartment osteoarthritis in active patients less than 45 years. Functional outcome results are satisfactory.

REFERENCES

1. Yadav AK, Parihar M, Pawar ED, Ahuja D, Gavhale S, Khanna V. Functional Outcome of High Tibial Osteotomy in Patients with Medial Compartment Osteoarthritis Using Dynamic Axial Fixator—a prospective study. *J Clin Orthop Trauma*. 2020 Oct;11(Suppl 5):S902-S908. doi: 10.1016/j.jcot.2020.07.033. Epub 2020 Jul 31. PMID: 32999578; PMCID: PMC7503148.
2. Coventry M B "Proximal tibial osteotomy. A critical long-term study of eighty-seven cases." *The Journal of bone and joint surgery*.
3. Roberto R. "The role of high tibial osteotomy in the varus knee." *The Journal of the American Academy of Orthopaedic Surgeons* vol. 19,10 (2011): 590-9. doi:10.5435/00124635-201110000-00003
4. Hui C, Salmon LJ, Kok A. Long-term survival of high tibial osteotomy for medial compartment osteoarthritis of the knee. *Am J Sports Med*. 2011;39(1):64-70. doi: 10.1177/0363546510377445.
5. Holden, D L et al. "Proximal tibial osteotomy in patients who are fifty years old or less. A long-term follow-up study." *The Journal of bone and joint surgery*. American volume vol. 70,7 (1988): 977-82.
6. Meading JB, Keating EM, Ritter MA, Faris PM. Total knee arthroplasty after high tibial osteotomy. A comparison study in patients who had bilateral total knee replacement. *J Bone Joint Surg Am* 2000;82(9):1252-9.
7. Yasuda K. "A ten- to 15-year follow-up observation of high tibial osteotomy in medial compartment osteoarthritis." *Clinical orthopaedics and related research*, 282 (1992): 186-95.
8. Bauer, G C "Tibial osteotomy in gonarthrosis (osteo-arthritis of the knee)." *The Journal of bone and joint surgery*. American volume vol. 51,8 (1969): 1545-63.
9. Insall, J N. "High tibial osteotomy for varus gonarthrosis. A long-term follow-up study." *The Journal of bone and joint surgery*. American volume vol. 66,7 (1984): 1040-8.
10. Fujisawa Y "The effect of high tibial osteotomy on osteoarthritis of the knee. An arthroscopic study of 54 knee joints." *The Orthopedic clinics of North America* vol. 10,3 (1979): 585-608.
11. Elson D W "High reliability in digital planning of medial opening wedge high tibial osteotomy, using Miniaci's method."
12. Lee D C. High tibial osteotomy. *Knee Surgery & Related Research*, (2012): 24(2), 61-69. <https://doi.org/10.5792/ksrr.2012.24.2.61>
13. van Wulfften Palthe A F Y "Survival and functional outcome of high tibial osteotomy for medial knee osteoarthritis: a 10-20-year cohort study
14. Rinonapoli E, Mancini GB, Corvaglia A, Musiello S. Tibial osteotomy for varus gonarthrosis. A 10 to 21-year follow up study. *Clin Orthop* 1998;(353):185-93.
15. Majima T, Yasuda K, Katsuragi R, Kaneda K. Progression of joint arthrosis 10 to 15 years after high tibial osteotomy. *Clin Orthop* 2000;(381):177-84
16. Berman AT, Bosacco SJ, Kirshner S, Avolio Jr A. Factors influencing long-term results in high tibial osteotomy. *Clin Orthop* 1991;(272): 192-8
17. Zaidi SHA, Cobb AG, Bentley G. Danger to the popliteal artery in high tibial osteotomy. *J Bone Joint Surg Br* 1995;77-B(3):384-6